



Scientific Publications of Shivaji University, Kolhapur (1989-2018): a Scientometric Study

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Abstract

The study is relies upon the scientific publications published by the Shivaji University, Kolhapur (1989-2018). The data collected from the Web of Science. The analysis includes yearly output of research productivity. The study focuses on Author Productivity pattern, types of documents/records, individual author's research productivity and their TLCS (Total Local Citation Score), TGCS (Total Global Citation Score) TLCR (Total Local Citation References) and TLCSb (Total Local Citation Score in the beginning), H-index and citation count of core contributors, Journal Publications, geographical collaboration of authors (countries of contributing authors) and distribution of research output by language.

Keywords Research Productivity, Scientometrics, Scientometric Analysis, Shivaji University Kolhapur, Web of Science, Scientific publications, H-index, Science mapping.

Introduction

In the fastest growing technological world of information communication technology & scientific research and development, an overwhelming amount of information / data in various formats is generated directly or indirectly. As far as academic and scientific community is concerned, a large number of scholarly communications are being published on daily basis by research scholars and academicians across the world. Scientometrics is the study of the quantitative aspects of science as a discipline or economic activity. It is part of the sociology of science and has application to science policy-making. It involves quantitative studies of scientific activities, including, among others, publications, and so overlaps bibliometrics to some extent. The researchers in scientific disciplines form the bigger, but also the most diverse, interest-group in Scientometrics. Due to their primary scientific orientation, their interests are strongly related to their specialty. The researcher tries to discover the scientific productivity of Shivaji University taken from the Web of Science database. In spite of the fact that Shivaji University was established in 1962, but our scientific outcomes turned out in 1989. 3961 outcomes were discovered from 1989 to 31st December 2018.

Area Study:

Shivaji University was established on 18th November, 1962 to cater to the long felt needs of the people of the three middle southern districts of Maharashtra, namely Satara, Sangli and Kolhapur. There are 37 departments in the University Campus, which spreads 853 acres (3.4519 km²), and is named after Chhatrapati Shivaji Maharaj, founder of the Maratha Empire. The number of student enrolments is steadily increasing. Moreover, University is committed to meet the Educational, Social, Cultural & Economic needs of the region and the nation to create a just and Humane Society by doing so many academic programs that are of benefit to the society in the direct manner. It is providing quality education, especially for the rural and socially and educationally underprivileged, through innovation in teaching, research and extension activities and providing human values for social harmony.

Objectives of the Study:

- i) To observe the Shivaji University's yearly research output in various scientific aspects from 1989 to December 2018.
- ii) To analyse the publications of Shivaji University based on the parameters like:
 - a) Subject wise Research Productivity.
 - b) Authorship Pattern.
 - c) Types of Documents Published.
 - d) Geographical Country Collaboration.
 - e) And Language wise research output.
- iii) To find out H-index and citations score of core contributors based on author rankings.

Research Methodology:

The Web of Science database was searched under the heading – Shivaji University organization oriented in the field of Search Box. And data processed for normalization and analysis through various tools such as Histcite, Bibexcel and VOSviewer.

Subject-wise research trend:

Table 1 and Diagram 1 shows Subject-wise research trend. Material Science is at the top in research yield of Shivaji

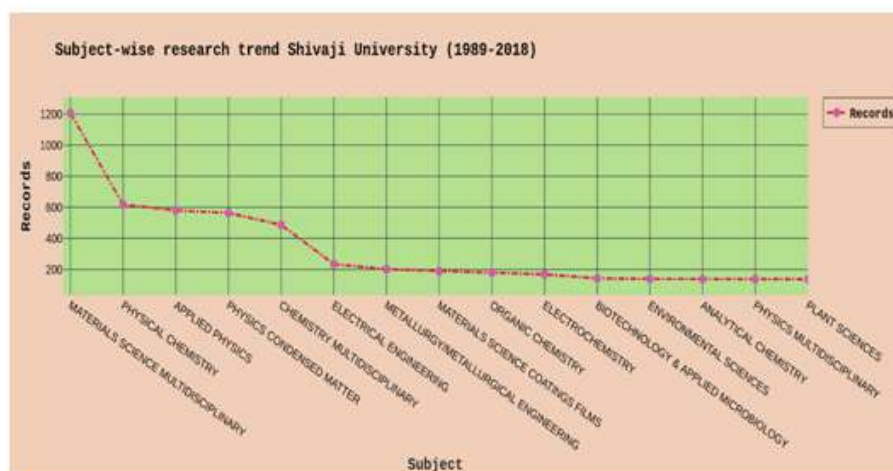


University, it covers 30.44% of all the research output. Physical Chemistry and Applied Physics are at second and third in research yield with 15.56% and 14.62% respectively.

Table 1-Subject-wise research trend (Shivaji University 1989-2018):

Sr.No.	Subject	Records	Percentage
1	Materials Science Multidisciplinary	1207	30.44
2	Physical Chemistry	617	15.56
3	Applied Physics	580	14.62
4	Physics Condensed Matter	564	14.22
5	Chemistry Multidisciplinary	487	12.28
6	Electrical Engineering	234	5.90
7	Metallurgy/Metallurgical Engineering	201	5.06
8	Materials Science Coatings Films	188	4.74
9	Organic Chemistry	179	4.51
10	Electrochemistry	168	4.23
11	Biotechnology & Applied Microbiology	142	3.58
12	Environmental Sciences	139	3.50
13	Analytical Chemistry	137	3.45
14	Physics Multidisciplinary	137	3.45
15	Plant Sciences	137	3.45
16	Energy Fuels	134	3.38
17	Engineering Chemical	121	3.05
18	Biochemistry & Molecular Biology	100	2.52
19	Materials Science Ceramics	99	2.49
20	Inorganic & Nuclear Chemistry	93	2.34
21	Nanoscience & Nanotechnology	89	2.24
22	Applied Chemistry	87	2.19
23	Multidisciplinary Sciences	81	2.04
24	Statistics	63	1.58
25	Instrumentation	59	1.48
26	Food Science Technology	50	1.26
27	Engineering Environmental	48	1.21
28	Crystallography	47	1.18
29	Optics	47	1.18
30	Polymer Science	44	1.11

Diagram 1- Subject-wise research trend line scatter(Shivaji University 1989-2018):



Authorship Productivity Pattern:

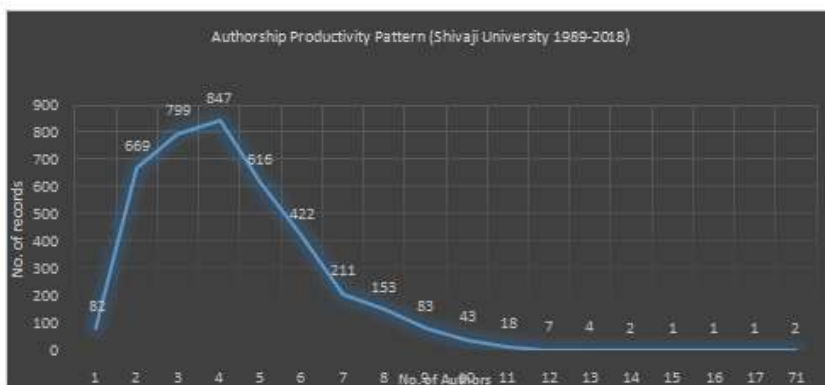
Table 2 and Diagram 2 shows authorship productivity patterns. Collaboration of research is evident in the field of scientific research. Only 82 records/research outputs were produced by single authors. 669 and 799 research outputs were produced by two and three authors respectively and two documents are written with contribution of 71 authors. It is clear that 2.07% of research was done by single author, 16.89% by two, and 20.17% by three authors of scientific publications.



Table 2 - Authorship Productivity Pattern (Shivaji University 1989-2018):

Sr. No.	No. of Authors	No. of records	Percentage
1	Single	82	2.07
2	Joint	669	16.89
3	Three	799	20.17
4	Four	847	21.38
5	Five	616	15.55
6	Six	422	10.65
7	Seven	211	5.33
8	Eight	153	3.86
9	Nine	83	2.10
10	Ten	43	1.09
11	Eleven	18	0.45
12	Twelve	7	0.18
13	Thirteen	4	0.10
14	Fourteen	2	0.05
15	Fifteen	1	0.03
16	Sixteen	1	0.03
17	Seventeen	1	0.03
18	Seventy-one	2	0.05
	Total	3961	100.00

Diagram 2 - Authorship Productivity Pattern Line Chart (Shivaji University 1989-2018):



Research Publications:

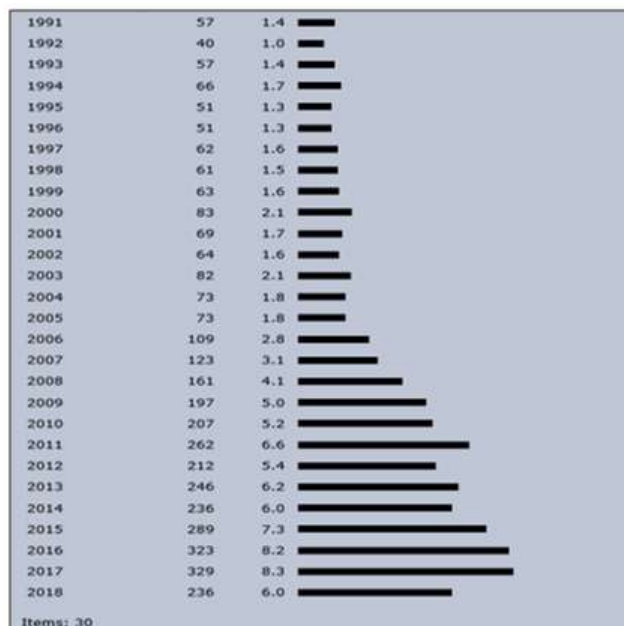
Shivaji University started to publish their research outlook in the year 1989. The publication curve is slowly increasing with ups and downs. The largest publication rate is seen in the year 2017. Highest Total Local Citation Score (TLCS) 189 is of the year 1994 and Highest Total Global Citation Score (TGCS) 6768 is of the year 2011. The year-wise distribution of literature is shown below in Table 3 and Diagram 3 (Histogram) shows the year wise research productivity of Shivaji University.

Table 3 - Year wise Publication metrics (Shivaji University 1989-2018):

Sr. No.	Publication Year	Records	Percent	TLCS	TGCS
1	1989	34	0.9	33	210
2	1990	45	1.1	124	310
3	1991	57	1.4	183	725
4	1992	40	1.0	61	195
5	1993	57	1.4	130	399
6	1994	66	1.7	189	713
7	1995	51	1.3	100	539
8	1996	51	1.3	0	617
9	1997	62	1.6	0	897
10	1998	61	1.5	4	926
11	1999	63	1.6	2	1617
12	2000	83	2.1	0	2578
13	2001	69	1.7	1	1570
14	2002	64	1.6	1	1328
15	2003	82	2.1	1	1771
16	2004	73	1.8	0	1691
17	2005	73	1.8	0	1816
18	2006	109	2.8	6	3149
19	2007	123	3.1	1	3662
20	2008	161	4.1	4	4394
21	2009	197	5.0	3	5216
22	2010	207	5.2	11	5371
23	2011	262	6.6	2	6768
24	2012	212	5.4	0	4125
25	2013	246	6.2	1	4782
26	2014	236	6.0	0	3475
27	2015	289	7.3	0	3114
28	2016	323	8.2	0	2491



Diagram 3 - Year wise Publications Histogram (Shivaji University 1989-2018)



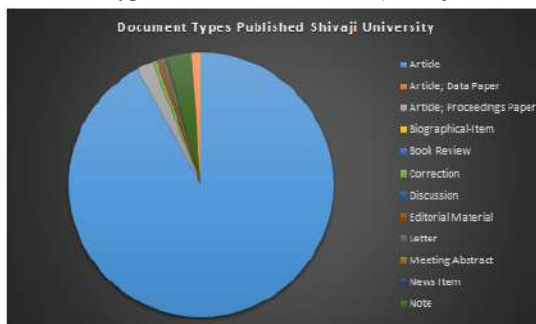
Document Types:

Document type indicates the type of publication in which the researchers published their research outputs. Most of them published in a form of articles. Table 4 reveals the distribution of the research output according to document type. It is an accepted fact that most of the scholarly communication of scientific research is published in journals as articles and sometimes presented in notes and proceedings papers. The TLCS (Total Local Citation Score) is 607 and TGCS (Total Global Citation Score) is 59879.

Table 4 - Document Types Published(Shivaji University1989-2018):

Sr. No.	Document Type	Records	Percent	TLCS	TGCS
1	Articles	3643	92	607	59879
2	Notes	118	3	168	581
3	Article; Proceedings Papers	77	1.9	2	1083
4	Reviews	48	1.2	49	4127
5	Corrections	20	0.5	0	6
6	Letters	19	0.5	32	255
7	Editorial Materials	18	0.5	0	54
8	Meeting Abstracts	6	0.2	0	1
9	News Items	6	0.2	0	13
10	Biographical-Items	2	0.1	0	0
11	Article; Data Papers	1	0	0	0
12	Book Reviews	1	0	0	0
13	Discussions	1	0	0	0
14	Retractions	1	0	0	0
	Total	3961			

Diagram 4 - Document Types Published Pie-chart(Shivaji University1989-2018):





Individual Authors Research Productivity:

Table 5 shows some of the author’s individual publications. It shows the author’s TLCS (Total Local Citation Score), TGCS (Total Global Citation Score) TLCR (Total Local Citation References) TLCSb (Total Local Citation Score in the beginning) and TLCe (Total Local Citation Score at the end). Lokhande CD is topmost author with published research records of 430. His pursuits 264 in TLCS, 16163 in TGCS, 241 in TLCR and 26 in TLCSb with 10.9% contribution to all-over research contribution of organization. Following research players are Patil PS, Kim JH and Bhosale CH.

Table 5 - Individual Authors Research Productivity (Shivaji University 1989-2018)

Sr. No.	Author	Records	Percent	TLCS	TLCS/t	TGCS	TGCS/t	TLCR	TLCSb
1	Lokhande CD	430	10.9	264	10.08	16163	1800.67	241	26
2	Patil PS	377	9.5	20	0.82	9384	1406.22	17	3
3	Kim JH	244	6.2	0	0	5276	1113.5	6	0
4	Bhosale CH	172	4.3	37	1.53	4415	547.58	73	2
5	Hankare PP	167	4.2	102	4.35	2464	246.62	63	25
6	Rajpure KY	165	4.2	0	0	4332	596.57	26	0
7	Govindwar SP	163	4.1	4	0.21	4329	568.46	3	3
8	Rao AV	140	3.5	31	1.97	4360	376.63	31	14
9	Mali SS	125	3.2	0	0	2464	466.42	3	0
10	Bhosale PN	121	3.1	1	0.09	1738	285.88	9	0
11	Moholkar AV	116	2.9	0	0	3201	533.37	2	0
12	Chougule BK	115	2.9	11	0.44	3107	245.92	42	2
13	Puri V	114	2.9	13	0.5	986	109.45	20	2
14	Deshmukh MB	108	2.7	4	0.32	521	79.11	8	0
15	Yadav SR	107	2.7	6	0.2	432	66.63	5	1
16	Kolekar GB	101	2.5	2	0.22	966	174.58	4	1
17	Pawar SH	101	2.5	84	3.06	1119	117.63	66	11
18	Garadkar KM	99	2.5	7	0.55	1766	249.42	48	3
19	Patil SR	92	2.3	10	0.53	873	160.53	5	1
20	Jadhav JP	91	2.3	1	0.09	1946	246.01	1	1
21	Fulari VJ	78	2	1	0.17	1389	231.31	8	0
22	Kolekar SS	78	2	0	0	1298	265.09	1	0
23	Shinde SS	77	1.9	0	0	2380	353.89	4	0
24	Dubal DP	76	1.9	1	0.17	3951	634.16	1	0
25	Patil SA	76	1.9	92	3.35	1281	84.49	32	14
26	Hong CK	74	1.9	0	0	1124	267.17	0	0
27	Anuse MA	73	1.8	0	0	610	76.62	4	0
28	Gokavi GS	67	1.7	6	0.24	707	76.78	7	0
29	Deshmukh LP	62	1.6	149	5.66	808	38.12	105	29
30	Anbhule PV	56	1.4	2	0.25	571	100.41	1	0

Diagram 5 - Author Productivity Cluster Diagram (Shivaji University 1989-2018):

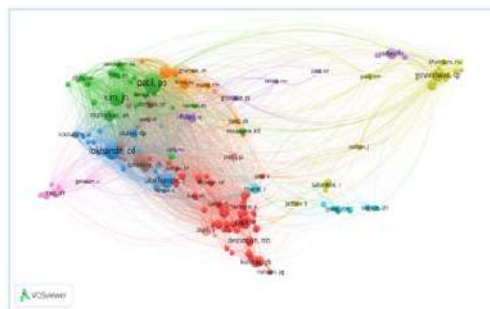
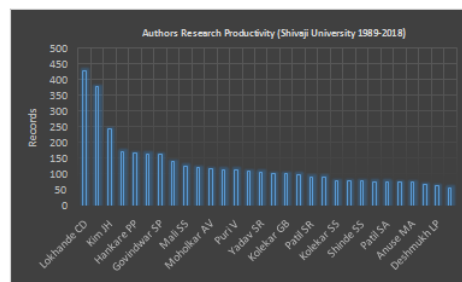


Diagram 6 Author Productivity Bar Graph(Shivaji University 1989-2018):





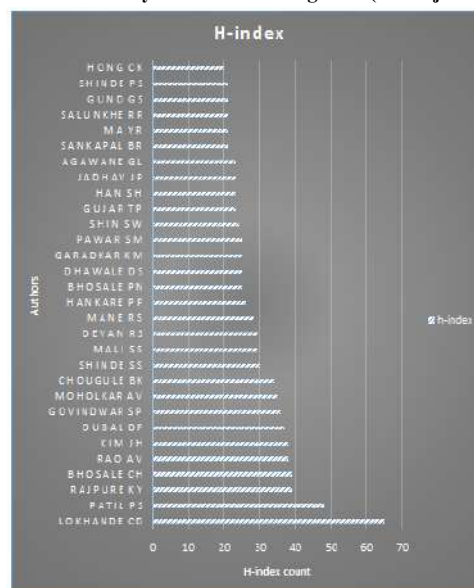
Authors H-index:

H-index is used as a measure to quantify the scientific output of a single researcher. However, the h-index can be used not only for the lifetime achievements of a single researcher but can be applied to any (more extensive) publication set. Top 30 H-index authors are given in following table 6.

Table 6 - Author Productivity H-index(Shivaji University 1989-2018):

Sr. No.	Author	All articles	Citation sum within h-core	h-index
1	Lokhande CD	430	8217	65
2	Patil PS	377	3975	48
3	Rajpure KY	165	2347	39
4	Bhosale CH	172	2380	39
5	Rao AV	140	2772	38
6	Kim JH	244	2485	38
7	Dubal DP	76	3281	37
8	Govindwar SP	163	2916	36
9	Moholkar AV	116	2103	35
10	Chougule BK	115	1938	34
11	Shinde SS	77	1718	30
12	Mali SS	125	1390	29
13	Devan RS	49	1482	29
14	Mane RS	52	2277	28
15	Hankare PP	167	1207	26
16	Bhosale PN	121	1003	25
17	Dhawale DS	34	1694	25
18	Garadkar KM	99	1053	25
19	Pawar SM	40	1540	25
20	Shin SW	53	1128	24
21	Gujar TP	33	1731	23
22	Han SH	54	1417	23
23	Jadhav JP	91	1423	23
24	Agawane GL	43	1089	23
25	Sankapal BR	29	855	21
26	Ma YR	35	895	21
27	Salunkhe RR	23	1382	21
28	Gund GS	24	1165	21
29	Shinde PS	41	1001	21
30	Hong CK	74	762	20

Diagram 7 - Author Productivity H-index Histogram (Shivaji University 1989-2018)



Journal Publications:

Table 7 shows the core journal publications of research output of Shivaji University. The abbreviations of TLCS (Total



Local Citation Score), TLCS/t (Total Global Citation Score per year) TGCS (Total Global Citation Score), TGCS/t (Total Global Citation Score per year) and TLCR (Total Local Citation References) are used. The research yield in the Journal of Alloys and Compounds was 187. Following that is the Materials Chemistry and Physics with 176 and Applied Surface Science with 141. Core journal publications of research communications shows the qualitative aspects of research endeavour.

Table 7 - Core Journal Publications (Shivaji University 1989-2018):

Sr. No.	Journal	Records	TLCS	TGCS
1	Journal of Alloys And Compounds	187	1	5253
2	Materials Chemistry And Physics	176	137	5988
3	Applied Surface Science	141	14	5605
4	Journal Of Materials Science-Materials In Electronics	134	1	1129
5	Indian Journal Of Pure & Applied Physics	90	118	577
6	Journal Of The Indian Chemical Society	76	11	336
7	Materials Research Bulletin	70	32	1419
8	Rsc Advances	67	0	845
9	Indian Journal Of Chemistry Section B-Organic Chemistry Including Medicinal Chemistry	62	24	229
10	Ceramics International	53	0	1017
11	Materials Letters	52	12	1059
12	Journal Of Magnetism And Magnetic Materials	45	18	1232
13	Bulletin Of Materials Science	44	38	909
14	Electrochimica Acta	44	0	1612
15	Indian Journal Of Chemistry Section A-Inorganic Bio-Inorganic Physical Theoretical & Analytical Chemistry	44	15	231
16	Research On Chemical Intermediates	39	0	108
17	Sensors And Actuators B-Chemical	36	1	1612
18	Synthetic Communications	35	9	324
19	Solar Energy Materials And Solar Cells	34	33	904
20	Journal Of Colloid And Interface Science	33	0	934
21	Journal Of Materials Science	33	20	692
22	Thin Solid Films	33	62	1097
23	Current Science	30	2	69
24	Journal Of Physics And Chemistry Of Solids	30	0	650
25	Spectrochimica Acta Part A-Molecular And Biomolecular Spectroscopy	22	0	411
26	International Bio deterioration & Bio degradation	21	0	545
27	Journal Of Molecular Liquids	21	0	208
28	Journal Of Photochemistry And Photobiology B-Biology	21	0	575
29	Journal Of Sol-Gel Science And Technology	20	0	380
30	Phytotaxa	19	0	10

Geographical Distribution:

Table 8 shows the country-collaboration of research productivity. Most scientists published their results in India, followed by South Korea, the Taiwan and Germany. Even though the scientists who published their research outputs in India, they got a TGCS (Total Global Citation Score) of 65924.

Table 8 Geographical Distribution [Collaborated countries (Shivaji University 1989-2018)]:

Sr. No.	Country	Records	TLCS	TGCS
1	India	3955	850	65924
2	South Korea	606	0	13726
3	Taiwan	75	0	2528
4	Germany	54	1	1963
5	France	53	9	1717
6	USA	50	8	677
7	Japan	31	27	1210
8	Spain	25	0	558
9	UK	21	0	228
10	Australia	12	0	176
11	Peoples R China	12	0	116
12	Nigeria	10	0	99
13	Russia	10	0	161
14	Saudi Arabia	9	0	160
15	Canada	8	0	49



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16	South Africa	6	0	69
17	Brazil	5	0	73
18	Ireland	5	0	61
19	Romania	5	0	75
20	Austria	4	0	87
21	Portugal	4	0	143
22	Switzerland	4	0	60
23	Argentina	3	0	10
24	Czech Republic	3	0	1
25	Egypt	3	0	96
26	Israel	3	0	91
27	Slovenia	3	0	14
28	Thailand	3	0	16
29	Turkey	3	0	75
30	Belgium	2	0	16
31	Iran	2	0	0
32	Italy	2	0	8
33	Pakistan	2	0	8
34	Slovakia	2	0	0
35	Sweden	2	0	0
36	Azerbaijan	1	0	84
37	Botswana	1	0	1
38	Chile	1	0	84
39	Finland	1	0	0
40	Greece	1	0	3
41	Netherlands	1	0	0
42	New Zealand	1	0	16
43	Singapore	1	0	0
44	United Arab Emirates	1	0	0
45	Ukraine	1	0	8

Research output by Language:

The distribution of research by language is presented in Table 9. All the research results are published in English. Following table conveys that very scientific communications are published in English as it is International language of communication

Table 9 Distribution of Research output by Language(Shivaji University 1989-2018):

Sr. No.	Language	Records	TLCS	TGCS
1	English	3961	858	65999

Findings:

- i) Material Science (Multidisciplinary) is at the top in research yield of Shivaji University it covers 30.44% of all the research output.
- ii) Only 2.07% authors have published their research individually. 97.94% of research was done by collaboration.
- iii) The highest number of publication in the year 2017 i.e. was 329.
- iv) The study shows, about 92% records are published as journal articles. So journal articles are termed as primary medium of research communication.
- v) Top H-index ranking author is Dr. C D Lokhande, his H-index is 65 & Citation sum within h-core is 8217.
- vi) In journal publication, Journal of Alloys and Compounds as the leading journal holds TGCS score 5253, Materials Chemistry and Physics and Applied Surface Science are at second and third rank holders.
- vii) Shivaji University scientists present papers with the collaboration of other countries like South Korea, the Taiwan and Germany. Though scientists produced 3955 research outputs in India, they got Local Citation Scores of 850 and Global Citation Scores of 65924.
- viii) The English language is dominating in learned communication. All of the publications are published in English only.

Conclusion:

Scientometrics is a study to measure the performance of the researcher as well as research publications, Nowadays, it has become an important field of study to monitor the progress in scientific performance of a research group, an organization, and a university etc. The study examines the performance based research output and develops benchmark to evaluate the quality of research endeavour & information output of Shivaji University.



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Appendix:

- **LCR - Local Cited References** shows the number of citations in a document/research communication’s reference list to other documentwithin the collection.
- **GCS - Global Citation Score** shows the total number of citations to a document/research communicationfrom Web of Science.
- **LCS - Local Citation Score** shows the count of citations to a document/research communicationwithin the collection.
- **CR - Number of Cited References** shows the number of cited references in the document/research communication’s bibliography.
- **LCS/t** = Local Citation Score per year from document/research communicationpublication to the end of the collection.
- **GCS/t** = Global Citation Score per year from document/research communication publication to the end of the collection.
- **LCSb**= Local citations at beginning of the time period covered.